201

facts about alcohol

RAYMOND G. McCARTHY

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Facts about alcohol

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I

You and alcohol

IT WOULD be hard to find a topic over which there is more difference of opinion than alcohol. Beer, wine, whiskey, and other beverages that contain alcohol have for many years been the subject of much discussion and disagreement. People feel and act in many different ways when it comes to the matter of drinking. You've seen it yourself.

When you visit Howard, for instance, you will find wine or beer served with dinner. Howard's folks consider these beverages an important part of the meal. They drink wine or beer much as other people drink coffee or milk.

Joan's parents, on the other hand, never have wine, beer, or whiskey in the house, and on no occasion drink them anywhere else. They don't approve of drinking. As a matter of fact, they feel that the sale of liquor should be outlawed.

At Jerry's house it's a different story again. You've seen his dad offer friends a drink when they come over, as a friendly gesture. Here drinking is considered important to social occasions, but otherwise Jerry's folks drink only rarely.

People's attitudes and feelings about drinking vary greatly. They differ from family to family, from church to church, from community to community.

Fact and fiction

There is a great deal of misinformation circulated about alcohol. That's why it's important to separate fiction from fact. Both drinkers and non-drinkers often use arguments based on misinformation to support their opinions. You may have heard some of them: *Alcohol's good for a cold—knocks it out in no time. Never begin drinking—once you start, you can't stop.* And so on.

General statements like these have been proved unsound by modern research. We know now that alcohol is no cure for a cold—or any other disease. We also know that of the people who drink, some go on to become uncontrolled drinkers, or alcoholics, as we call them. But most do not.

There *are* serious problems connected with the use of alcoholic beverages. Uncontrolled drinking is a problem that affects us all, because the public must bear the cost of the damage the uncontrolled drinker causes to himself and others. Our hospitals, our jails, and our welfare agencies are called on to carry extra burdens. Industry suffers losses when the drinker doesn't appear on the job. And the alcoholic's children, growing up in an unsatisfactory environment, may also become problems to society.

What are the real problems connected with drinking? How can they be handled? To answer these questions we need to have the *facts* about alcohol—at least as many as are known today.

What about you?

You will some day develop your own personal attitudes and beliefs about drinking. Perhaps you already have. Your attitudes will be influenced to a large extent by your family, your friends, and the things you read and hear and see about drinking. Because you will run into so many different opinions about alcohol, you may find it difficult to make up your own mind.

You may or may not decide to drink. But whatever your decision, you will always be running into people who drink. You'll find yourself

Jerry's folks drink on social occasions; Joan's parents never touch liquor.

The many conflicting opinions on drinking may make *your* decision difficult.

in situations where it's accepted. You may be *for* drinking or *against* it, or believe that some people should drink and others should not. Whatever your opinion, you'll want to be sure you've considered all the facts first.

"But the question of drinking is a private, personal one," you may say. "I want to decide it with the help of my family or minister. Their opinions are more important to me than a mountain of facts."

You will probably not decide for or against drinking on the basis of facts alone. Your convictions and beliefs about important questions are a *combination of your feelings plus your knowledge of facts.* Both are important in making any decision. But it will be to your advantage to base your attitudes and convictions on facts rather than on popular misinformation.

In this booklet we'll discuss many of the facts about alcohol and drinking that have been discovered by research. We'll also discuss people's attitudes and how their feelings have influenced the entire alcohol question. This information should help you gain a better knowledge of what the problems are and what is being done to solve them. Your future attitudes and actions in regard to drinking should be based on a sense of personal responsibility that rests on an understanding of the problems.

II

Feelings about alcohol — past and present

NO MATTER how far back we look through old musty manuscripts, no matter how many ancient worlds we dig up in excavations or bring to light from sealed pyramids—we find records of people using wine and beer. Whether primitive or civilized, whatever their race and nationality—people through the ages have included alcohol as part of their lives.

How have all these other civilizations felt about drinking? Have people always been divided "for" or "against"? Have our own opinions today been influenced by people of the past? Let's take a look.

In primitive and Biblical times

Alcoholic beverages were regarded with some awe by primitive tribes. They believed that one of their gods got into the wine. That was the only way they could account for the strange feeling it gave them. They thought it must be magic!

Wine and beer played an important part in primitive life, especially on great occasions. When everyone in the village drank together they had a feeling of "belonging," of good fellowship.

Young tribeswomen were sometimes considered unworthy of drinking, since intoxication was felt to be a kind of sacred state. But they often served as primitive MP's at the men's drinking parties. If someone got out of hand, they would tie him up and keep him under control until he was sober and ready to behave.

The primitives felt that alcohol was important. But they also saw to it that the welfare of the group wasn't sacrificed because of drunkenness.

Countless folk stories about drinking have come down through the ages. According to an ancient Hebrew myth, Noah, while plowing, was approached by Satan who asked what he was doing.

Noah replied, "I'm planting a vineyard. When the fruit is ripe, the grapes are excellent to eat, either moist or dried. And when pressed, the juices become wine which warms the body and the spirit."

Satan suggested that they become partners in the vineyard and Noah agreed. Then Satan brought a sheep, a lion, a pig, and a monkey, and slew them so that the blood of each animal flowed about the roots of the vines. This was understood as a sign that man, before drinking, is like a sheep—mild and inoffensive. When he begins to drink he feels like a lion—strong, boastful, ready to meet all comers. If he drinks deeper, he begins to chatter aimlessly, scampers about and behaves like a witless monkey. If he drinks still more, then, smeared with food and drink, he finally drops to the ground, wherever he may be, wallowing in his own filth.

An old myth compares the stages of drinking to the characteristics of animals.

There are many early references to the use of wine by people of different races. Biblical accounts show that wine was commonly used in small amounts by the Hebrews and early Christians. The miracle of Cana took place when the wine at a wedding feast gave out and more was needed immediately to save the host from embarrassment. But drunkenness also occurred in Biblical times and was sternly condemned. St. Paul rebuked the drunkard, declaring, "Let us walk becomingly as in the day, not in revelling and drunkenness."

Later, the medieval church denounced drunkenness, and Luther sharply criticized his fellow Germans for excesses in drinking. The 17th-century Calvinist churches and the early Puritans permitted the use of drinks containing alcohol, but also condemned drunkenness.

A new ingredient

As we moved toward modern times, something new influenced attitudes toward alcohol—nationalism. You know how Californians feel about their super-oranges, and Kansans about their super-corn. Certain nations became known for the particular alcoholic drinks they produced—southern Europe for its wines, Germany for its beer, and England for its ale. It became a matter of pride to prefer the beverage of your native country. The production of alcoholic beverages gradually assumed economic and political importance.

In early America—use and abuse

When Englishmen began to settle in this country they brought with them the customs and ideals of England. One of the traditions was that beer and wines had health-giving properties. And so these beverages were widely used in the wild new land of America. There was a lot of work to be done—forests to be chopped down, towns to be built, whole new territories to be formed. A good pot of ale, the settlers believed, could spur a man on, give him the strength for these giant-sized tasks. And with doctors few and far between, they felt there was nothing like a spot of rum or beer to ward off chills and fever. By 1750, rum was widely used in the colonies for such purposes.

The ordinary use of alcohol was not considered sinful in colonial America. It was excessive drinking—drunkenness—that New England Puritans thought was immoral. Drunkenness meant loss of time and set a bad example for young people. In other words, they felt, as primitive tribes did, that what harmed the individual or the group must be bad. They also felt, as many people do today, that drunkenness was debasing to human dignity, that it made men like animals. There were penalties for tippling and uncontrolled use of drink.

But the moderate use of alcohol in beverages was acceptable in the colonies. Up to 1800, beer and rum were part of almost every social get-together—christenings, funerals, and political meetings. Even apart from social functions, beer and wine were taken regularly as beverages. Beer was part of the daily diet at Harvard College.

Beginnings of the temperance movement

Early in the 19th century, many people's ideas began to change. Drinks like rum and whisky, not widely known until after 1500, were coming more and more into use. Many religious and civic leaders felt that the daily use of these drinks, which were much stronger than wine or beer, was dangerous to the health and morals of the nation. These leaders formed "temperance" groups to convince people to be moderate—temperate—in drinking. They wanted people to abstain from drinking the stronger spirits, such as rum and whisky, although they felt it was all right to use beer and wine. These early organizers believed that men had been drinking to excess because they didn't understand the physical effects these beverages had on them. This movement was also in line with the religious idea that any abuse of the body is sinful.

However, the frontier people who were settling the country west of the Appalachians still felt that a glass of spirits could set you up for a hard day's work. Soon they started turning the corn they raised in the West into whisky. This became an important source of income.

Beer and wine, too

Around 1840, there was another change. Temperance groups prepared a new pledge for people to sign, which called for them to give up "all that may intoxicate," *including beer and wine.* This step touched off some loud arguments, and we can still hear echoes of them today.

Many people said, "This pledge contradicts the Bible, which says that wine is all right. And after all, a lot of churches use it in religious services!"

But others felt that the wine mentioned in the Bible was not intoxicating, because the Lord wouldn't have approved of any wine that meant abuse of body and spirit. They believed that unfermented (or nonalcoholic) grape juice should be used in church services.

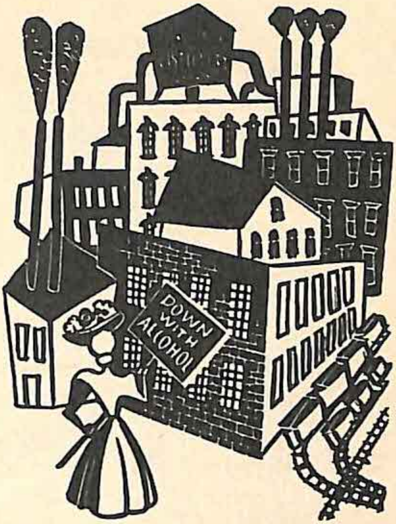
A number of churches couldn't accept this idea and continued to use wine. They took the stand that alcoholic beverages were fruits of nature and therefore good. They felt, as many people do today, that it was the abuse, not the use, of alcohol that was bad.

Alcohol—forbidden by law

Temperance leaders came to the conclusion that the only way to cope with the issue of drinking was through law. They wanted to legislate alcohol out of existence.

Many people agreed. Even before the Civil War there was alcohol legislation. By 1919, 33 states had prohibition of some kind. Then Congress passed the 18th Amendment, which forbade the manufacture and sale of all alcoholic beverages throughout the land. This act was in force for 13 years, from 1920 to its repeal in 1933 by the 21st Amendment.

There is still a debate going on as to whether prohibition was effective or ineffective. Some people believe that control of drinking was better during those 13 years than at any time before or since. They point to the drop in hospital admissions for alcoholic diseases. They bring up the gains in bank deposits and employment. They say that a small group of wealthy men combined with the distilling and brewing industries to "put over" repeal. They claim that nationwide prohibition can work if it's given popular support and enough funds for enforcement.



Temperance leaders wanted to outlaw the manufacture of alcohol.

On the other hand, many people claim that prohibition *didn't* work. They say that the alcohol supply was cut down during the first two or three years, but that later anyone could get all he wanted. They claim that liquor production and distribution again became a big business—only this time untaxed and lawless. They also point out that these conditions led to a general nationwide disrespect for law and order. They feel the law didn't really have the support of the people and that any such law shouldn't be on the books. And they say that gains in bank deposits and employment were due not to prohibition but to industrial expansion and prosperity following World War I.

These arguments were given by people who worked for or against the 18th Amendment, and they're still used today by groups who are not satisfied with the liquor situation. Some groups are still working to outlaw alcohol. They have introduced legislation in Congress to curb advertising of alcoholic beverages in interstate commerce. And they campaign for "dry" areas on a local level. Many of these groups feel that alcohol is an evil thing and that the alcoholic beverage industry is fostering it.

On the other hand, many people who remember prohibition hold that outlawing liquor won't work. These people, who are both drinkers and non-drinkers, feel that the best approach to the problem is through public education. Like the early temperance leaders, they believe that if people knew the facts about alcohol, they would be temperate.

How do we stand today?

How do most people feel about alcohol today—in terms of the way they vote and the laws they pass?

Laws regarding the sale of alcohol are different in various states.

If you live in an average American community, it's likely that alcoholic beverages are for sale and are in common use there. However, if you live in Mississippi or Oklahoma, there are no distilled beverages (such as whisky) sold legally, although licenses are issued for selling beer and light wines. If you live in any other state, or in Washington, D.C., all alcoholic beverages are sold somewhere in the state.

Seventeen state governments have branches that operate stores selling distilled beverages. These branches also issue licenses for private sales of beer and wines. This is called the state-monopoly system. But if you live in an "open-license" state, you can buy liquor in restaurants, taverns, hotels, and stores.

Some day you may have to vote on whether alcoholic beverages should be sold in your community. Thirty-three states make provision for this sort of "local option." You may be voting on whether to prohibit the sale of distilled liquors alone, or of all alcoholic beverages.

When such an issue comes up, voters are given a lot of "information" by the ardent drys on the one hand, and by the ardent wets (including the alcoholic beverage industry) on the other. Both wets and drys often give out propaganda rather than facts. To be well informed on this question you must be able to distinguish between the two.

Until recently there has been no organized effort by neutral parties to spread facts. But with new public awareness of and interest in the problems of alcohol, such facts are being made available.

III

Your stock of facts

JUST how much do you know about alcohol? If your hiking companion gets bitten by a snake, will a drink of whisky prevent any ill effects? If you begin drinking, will this set up a kind of chain reaction—a physical craving for more and more alcohol? Is alcohol a stimulant?

You'll probably find yourself somewhat short on answers to these and other questions on alcohol. Most people are in the same boat, despite the fact that research has uncovered more and more facts about drinking. For years now, facts about alcohol have been gathered by careful scientists working in laboratories, and interested doctors working in clinics and hospitals. But this information doesn't always reach the greater part of the public.

Taking stock

Although there is a great deal of misinformation passed along on the subject of alcohol and drinking, you may have more facts than you realize. How can you find out just what you do know?

Just as many businessmen do, you can take inventory—count your stock. Then you'll know just what facts you have on the shelves, and more important, you'll have an idea of what's missing, what you need to fill out your stock.

A checklist for your inventory is given below. The statements listed are opinions commonly held by many people. Some are based on fact, others are not. Opposite each statement with which you agree or disagree check one of the boxes either *True* or *False*. In the cases where you can't decide, check the box marked *Uncertain*. After you've finished, compare your answers with those on page 15.

Basic information checklist

	True	False	Uncertain
1. The chemical action of alcohol on your nervous system is the same as the action of ether or other anesthetics.	☐	☐	☐
2. If you drink undiluted whisky, it will irritate and inflame the brain.	☐	☐	☐
3. A person who drinks regularly keeps setting up an increasing physical craving for more alcohol.	☐	☐	☐
4. Two or three drinks can reduce your efficiency and coordination in operating a machine.	☐	☐	☐
5. It's a sign of masculinity to be able to drink a lot.	☐	☐	☐
6. People who serve beer or cocktails at parties won't invite you to be a guest if you don't drink.	☐	☐	☐
7. Alcoholism is a sign of a personality disorder.	☐	☐	☐
8. Scientists can predict which individuals in a group of beginning drinkers will become alcoholics.	☐	☐	☐
9. Drinking is a question of mind over matter; anyone can control his drinking if he really wants to.	☐	☐	☐
10. Some people are better drivers after a couple of drinks because then they purposely drive more carefully.	☐	☐	☐
11. If a person feels satisfied with himself, his family, friends, and job, alcohol will have only a limited appeal for him.	☐	☐	☐
12. Drinking may weaken your drive or desire for success in school relations.	☐	☐	☐
13. A respectable family background, good education, and success in business will keep a drinker from becoming an alcoholic.	☐	☐	☐
14. Alcoholic drinks are necessary at a party if young people want to have a really good time.	☐	☐	☐
15. For young people, the most immediate danger in drinking is intoxication.	☐	☐	☐

The Basic Information Checklist is derived, by permission, from *Facts and Fancies About Alcohol* by R. G. McCarthy.

Answers

1—True
2—False
3—False
4—True
5—False
6—False
7—True
8—False
9—False
10—False
11—True
12—True
13—False
14—False
15—True

How did you come out? If you got most of the answers right, you're pretty well informed. The chances are, however, that many of your answers were incorrect or marked *uncertain*. Don't let this discourage you. It simply means that you, like a great many other people (both drinkers and non-drinkers), do not have as many facts as you should have about alcohol. That's why this booklet was prepared. When you've finished reading it, take the quiz over again, covering up your previous answers. This will help you see if you've developed a better understanding of the subject.

The many-sided problem

Scientists working on the alcohol problem recognize how complicated it is. They know, too, that such a complex human problem involves many factors. They try to understand as many different *parts* of the problem as possible in order to gain an understanding of the *whole*. The spotlight of science is turned on three main areas. If you go back over your basic information checklist you'll see that the statements fall into three groups—depending on what kinds of facts are needed to prove them right or wrong. There are statements that call for facts about: (1) *alcohol itself*, (2) how *alcohol works on the human body*, and (3) *the connection between alcohol and personality*—why people drink, and how their aims and inner lives are affected by it.

The questions that scientists are trying to answer come under these three areas. For example, they're asking:

- Why do some people drink only rarely, others regularly? Why do some people never drink?

- What, if any, are the physical risks for young people in experimenting with alcohol drinks? What are the psychological risks?

- What is the story behind alcoholics—people who can't control their drinking? How do they get that way?

Research on these and many other questions has brought us facts about alcohol, its physical effects, and about alcoholism—its causes and effects. For a complete picture, you should know something about the findings in all three areas.

You don't have to know it all

"But," you say, "this is getting to be a bit too much. How can I become a full-fledged expert on all the facts about alcohol?"

You don't have to know all the details to understand the alcohol problem.

You don't have to know all the details of the problem. Understanding and accepting a few basic facts will give you enough background so that you can form sound opinions.

These opinions need not be the same for everyone. You and your friends may disagree on some of the checklist statements. You yourself may not agree with all of the answers. But some disagreement is good, because it means you have to back up your stand with facts or else "step down." You will be *thinking* and can use facts as a solid foundation on which to build your own opinions.

IV

What are alcoholic beverages?

THERE are many kinds of alcoholic beverages. Some are sweeter than others. Some are browner or yellower or redder than others. Some are stronger than others. How do they *get* that way?

Wine and fermentation

We have no cave-wall pictures to prove it, but primitive man probably discovered wine by accident. We can imagine him pressing into a gourd the pulp and juices of some prehistoric plant as he was getting ready for a meal. Just then, hunting game or perhaps an enemy tribe suddenly appeared. Anyway, he ran off leaving the fruit-filled gourd exposed to the air. Weeks later he found it again. He tasted the fruit juice and noticed that the flavor was changed. It was mildly bitter, but rather pleasant. So he drank it. Soon he experienced sensations he'd never felt before from drinking the juice of the same plant. To the primitive man, this change was magic, for how else could one thing change into another all by itself?

Of course, today we know that the fruit juice didn't just stand there by itself. Something new had been added—a microscopic plant called *yeast.* This plant, which had been floating about in the air, was deposited in the open gourd. Then the yeast rolled up its microscopic sleeves and started some chemical changes. It changed the sugar in the fruit juice to *alcohol* plus a gas, called *carbon dioxide,* which bubbled away. (This gas, by the way, is what makes your nose tickle when you drink charged soda water and soft drinks.)

We've given this process a name—*fermentation.* It continues until much of the sugar in the fruit juice has been changed to alcohol. The final product of fermentation—the wine—may contain up to 14 per cent alcohol. At about this point there's enough alcohol present to kill off the yeast. This stops the process, and the fermentation is complete.

Wine can be made out of the juices of vegetables, berries, and fruits that vary a great deal in taste and color. However, in Europe and America the wine is usually made from grapes. Sparkling wines, like champagne, are "bubbly" because some of the carbon dioxide has been allowed to remain.

We've been describing simply fermented wines. But in the United States, *strengthened or fortified wines* are more common. In this type of wine, distilled spirits—more alcohol—are added after fermentation has stopped. This raises the alcohol content, sometimes as high as 21 per cent.

Brewing and beers

Our primitive wine-discoverer gathered his food from trees and bushes or hunted it down. Later, tribes began planting simple crops like cereals. That's when beer was discovered, for it's made by boiling a broth of cereals such as barley, wheat, or corn.

Of course, you can't just boil up a little breakfast cereal and get beer. You need yeast for fermentation. And in brewing, yeast needs a fellow worker called *malt.* Malt is barley that has been steeped in water, allowed to sprout, and then is dried and powdered. What is it for? Well, you know that the yeast changes sugar into alcohol. But in these cereal grains sugar takes the form of starch. So teamwork is needed. First malt goes in and changes the starch to sugar. Then yeast can go ahead and do *its* job.

In brewing beer, fermentation is interrupted before it has had a chance to finish its work. So less sugar is changed to alcohol than when wine is fermented. That's why beer contains less alcohol than wine and isn't as strong. In this country, beer contains about 4 per cent alcohol.

The foam or "head" on a glass of beer is caused partly by the carbon dioxide that didn't escape because the fermentation process was interrupted.

The varieties of beer and ale are the result of brewing with different kinds and amounts of cereals and water, plus differences in processing. There are other variations, too, such as the addition of a small bitter fruit (hops) to beer.

Distillation and distilled beverages

When a liquid is heated to the boiling point, it changes to steam or vapor. Different liquids have different vaporizing points. For example, alcohol boils at a lower temperature than water. So if you heat up a mixture of alcohol and water, the alcohol will start vaporizing first. If the alcohol vapor is passed through a cooling tube, it will change back to a liquid that is almost pure alcohol. You've left the water behind.

There's more alcohol in distilled drinks (like whisky) than in beer or wine.

This kind of process is used in making distilled drinks like whisky, rum, and brandy. A fermented liquid like wine or beer is boiled. The recaptured alcohol vapor is flavored by the liquid from which it's been boiled. In fact, there is no attempt to make pure alcohol; instead, some of the other ingredients in the fruit or grain are allowed to boil off with the alcohol. There are different flavors and colors for the various beverages because whisky is distilled from grain brews, brandy is made from various wines, rum is made from molasses and sugar, and gin is made from alcohol flavored with juniper berries.

The distilled drink will contain much more alcohol than the fermented brews from which it's made, since mostly alcohol vapor has been condensed. In fact, distilled drinks will have from 40 to 50 per cent alcohol. Compare that with the 14 per cent top limit for ordinary fermented wine, the 21 per cent for fortified wine, and the 4 per cent for beer.

Distilled drinks, however, are not often taken "straight." They're combined with sugar syrups and flavoring in cordials and liqueurs, and with fruit juices, charged water, and other liquids in cocktails and highballs. Unless greatly diluted, distilled drinks intoxicate more rapidly than wine or beer in the same amounts.

Alcohol—the important ingredient

Why have alcohol drinks been so popular through the ages? People have at times used them as tonics, as strength-giving beverages. Until quite recently, alcoholic beverages were considered necessary to health, particularly among men who had to work in extreme temperatures or at heavy physical labor.

But modern science has shown that alcohol is not a medicine. As for taste and thirst-quenching qualities, such drinks are not necessarily better than, or even as good as, such standbys as water, milk, and soft drinks. People drink alcoholic beverages because they like the way the drinks make them feel—"friendly," "good," "less worried." And it's the *alcohol* in drinks that make these feelings possible.

Then what about alcohol? What's it like? How does it work?

From anti-freeze to perfume, alcohol has many uses besides that in beverages.

You've met up with alcohol before, even if you've never had a drink. Maybe you've dabbed it behind your ears on Saturday nights (it's in perfume), or used it to preserve specimens in biology class. Your mother may have given you a rubdown with it after that ten-inning game, or you may have poured it into your car for cold-weather protection. Alcohol also played a part in the manufacture of your plastic raincoat.

There are many kinds of alcohol which are used for commercial and industrial purposes. But these types—methyl, butyl, and others—are dangerous to drink. *Ethyl* alcohol, a colorless liquid that evaporates quickly, is the kind that's in beer, wine, and distilled spirits.

Alcohol in the blood

A person feels and acts more "tipsy" as the concentration (the proportion or per cent) of alcohol in his blood rises. But how does alcohol

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get into his blood in the first place? And how is the concentration built up?

Like other foods, alcohol is swallowed and soon lands in the stomach. But *unlike* other foods, it's absorbed into the blood immediately, without need for digestion. It passes right through the stomach wall and the walls of the small intestine. That's why it affects the body much more quickly than ordinary foods, which have to be digested before they can pass into the blood and body fluids.

The alcohol will be absorbed, and will act, slowly if a person has just eaten. And wine or beer will act more slowly than distilled spirits, since they have a smaller proportion of alcohol. (Wine and beer also contain more of other things—pulp, grain, and so on—that are food products and have to be absorbed at the same time.) And, of course, the slower the drinking, the more time between drinks, the slower absorption will be.

The blood carries the alcohol to all organs and tissues of the body. A larger share goes to organs like the brain that contain the most fluids. But the body at once begins to get rid of the alcohol. Small amounts are eliminated through the breath and the urine, but most of the alcohol is oxidized, or burned. *Oxidation* is a series of chemical changes, beginning in the liver, by which the alcohol is finally reduced to carbon dioxide and water.

Now we see a kind of biological relay race. Oxidation goes on at a fairly regular, fixed rate, but alcohol absorption may go on faster or slower, depending on the amount drunk. When the rate at which the alcohol is absorbed overtakes the rate at which it's oxidized, the per cent of alcohol in the blood—and throughout the body—rises. What happens then?

How alcohol affects you

Although the concentration of alcohol in drinks may be anywhere from 4 to 50 per cent, *the proportion of alcohol in the blood practically never goes up to more than half of one per cent at the most.* This seems surprising, but there are good reasons for it. For one thing, most drinks are greatly diluted with ice or soft drinks or fruit. Even when distilled liquor with 50 per cent alcohol is taken straight, the alcohol content is cut to 10 per cent or lower by the increased flow of stomach juices. When the body begins to absorb the alcohol it's diluted even more by the blood and other body fluids.

Yet within this small range—from zero to half of one per cent alcohol—a drinker can run the gamut from mild "tipsiness" to stupor.

With less than 5/100 of one per cent of alcohol (five parts in ten thousand) he'll feel little change.

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With between 5/100 and 15/100 of one per cent, he'll be disturbed in movements and speech. He'll feel "different."

With 15/100 of one per cent or more, he'll probably be intoxicated.

When the concentration reaches 4/10 of one per cent, he passes out.

At half of one per cent, he'll be in danger of death from deep anesthesia. At higher concentrations, paralysis of the nerves that control breathing can take place, resulting in death.

This shows us an important fact —that alcohol at low concentrations does not *directly damage* the organs or tissues of the body. A strong concentration of alcohol—50 per cent or more—will cause changes in plant and animal tissue. It will, for example, sting if you apply it directly to sensitive tissue. But as we've seen, alcohol in the blood never reaches a concentration of more than *half of one per cent.* And in such diluted form it can't irritate and injure healthy organs and tissues of the body. In fact, nothing less than 5 per cent concentration can do this.

Distilled beverages are usually diluted with ice or soft drinks.

People who drink a great deal of undiluted distilled liquor may get inflamed throats and stomachs, but only because the alcohol comes in contact with these parts of the body *before* being diluted by the blood. Alcohol can bring on illness and cause changes in behavior, but it does so in an *indirect* way, which we'll discuss in the next chapter.

V

Alcohol at work

HOW DOES alcohol go to work on us to change the way we feel and act? What does it do?

Many people feel more lively after a few drinks and believe that alcohol acts as a "pick-me-up," like coffee. Some people after drinking coffee feel more alert mentally. The caffein in it speeds up their heartbeat and circulation. We may drink a lot of coffee if for some reason—like a big exam—we have to be on our toes. So coffee is called a *stimulant.*

Alcohol—stimulant or depressant?

What about alcohol—is it a stimulant too? It certainly seems to be, at first glance. Take the tired businessman who stops off for a drink after a busy day. Somehow that one drink seems to pick him up, make him more alert and less tired. Or take the same man at a party. After a few drinks he may be having a gay time, telling jokes and laughing loudly. After several more he's really active, perhaps arguing and insisting that his friends join him in all sorts of practical jokes.

But take another look at our friend after several more hours and many more drinks. He's slowing down. He seems to be having trouble holding his glass. And he can't seem to focus his eyes or pay attention well enough to understand what people say to him. In a little while, after a few more drinks, he passes out cold. He's completely unconscious.

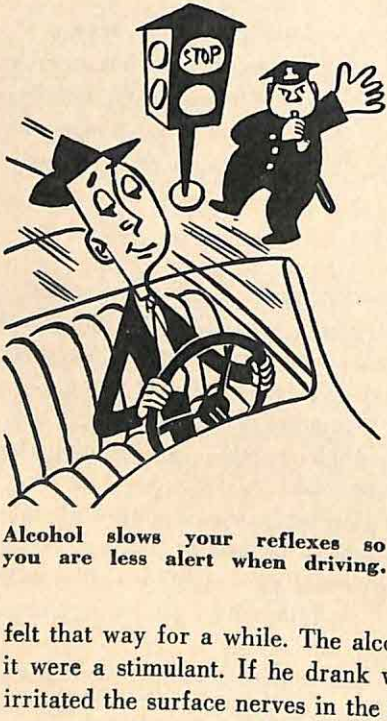
This is anything but the reaction you'd expect from a *stimulant!* Actually alcohol is just the opposite. It's a *depressant.*

If your doctor has ever given you a sedative when you were ill, you know pretty well what a depressant is like. It acts on the nervous system to slow down all your physical reactions. Your heartbeat gets slower, your blood pressure goes down. You relax. And, as always, your body affects your mind. You don't think as clearly or as rapidly. You forget your pains and worries, and finally fall asleep.

You can see a good example of how a depressant works in the laboratory. Let's take that boon to modern science—the white rat—and place him on his back. He rights himself, scrambles to his feet, immediately. Now let's hold him by the tail and bring him near a table edge. He immediately starts grasping for support. Brother rat is showing *reflex actions*—automatic responses of his nervous system over which he has no control. (Like the reflex that makes your leg pop up when the doctor hits it in a certain place with that little hammer.)

Now let's give brother rat some alcohol. What happens? Gradually, as we give him more and more alcohol, his reflex actions slow down and finally disappear altogether. When you place him on his back, he just lies there, making no effort to right himself. Try holding him by the tail, and he makes no move to grasp for support. Hours later, when all the alcohol in his body has been burned, his reflexes are back to normal and he acts the way he did before the alcohol was given to him.

In the same way, a human's reflexes are slowed down or depressed by alcohol. He (or she) won't react as alertly or as quickly in manipulating machines or in driving a car, for instance.



Alcohol slows your reflexes so you are less alert when driving.

Why that lift?

"Sounds convincing," you may say, "as far as rats go. But how about the tired businessman who felt less dull, more alert after that before-dinner drink? Wasn't *he* stimulated by the alcohol?"

Not really, though he might have felt that way for a while. The alcohol may have acted, very briefly, as if it were a stimulant. If he drank whisky that was undiluted, it may have irritated the surface nerves in the throat and esophagus. His central nervous system, by a sort of chain reaction, picked up the stimulus and began to make the heart and pulse speed up. But this lasted only until the undiluted drink was absorbed into the blood. After that the alcohol becomes so diluted that it can't irritate tissue.

As for that lift, that "I'm-not-tired-any-more" feeling, surprisingly enough this is produced just *because* alcohol is a depressant. Alcohol dulls our businessman's mind and nervous system. He's no longer aware of all those tiny aches of fatigue, just as you weren't when the doctor gave you a sedative, or the dentist injected Novocain. Also, our man may be momentarily eased by a "warm" feeling. This is because the alcohol dilates blood vessels near the skin, which brings heat to the surface of the body.

Relaxing the valves

But if alcohol isn't a stimulant, why does it often make people act so much gayer and livelier than usual? The biggest prankster at a party may be the quietest, mildest kind of fellow imaginable when he hasn't had anything to drink.

This is just further proof that alcohol is a depressant. We've all felt the urge at times to do or say something we know other people would frown on. "Listen, coach," you may want to shout, "if you don't like the way I threw that pass, just try it yourself. I quit!" But we don't go around blowing off steam all the time. We want to get along with our friends, families, teachers, and employers. So we control our feelings.

Some people don't have too much difficulty keeping the steam in check. Others have to exert quite a lot of control. As a result, when they do lose control, the results are apt to be explosive.

Controls act like valves on a steam boiler. Tightly shut, they keep the steam inside. But because alcohol is a depressant, it relaxes both bodily and mental actions. It loosens mental controls. Drink a little and the valves don't grip as well. They open slightly and the steam begins escaping, maybe with just a low hiss, but if there's enough pressure inside, with a big bang.

The same sort of thing happens to a patient under ether. After a few whiffs, he may feel excited, talk a lot, and even make embarrassing remarks. Controls are loosening. As the effect increases, his faculties get more and more dulled, until finally he passes out.

Sound familiar? Of course. Our friend at the party went through similar stages under the influence of alcohol.

As we saw in the last chapter, a person's behavior changes as the amount of alcohol in his blood increases. Now we know *why* these changes take place. With a low concentration of alcohol, there is a mild sedative action. When the concentration builds up, the depressant action slows down the nervous system and the bodily and mental functions, including the mental controls. Finally, the drinker loses consciousness just as he would from an anesthetic like ether.

It's important to remember, though, that the effects of alcohol depend on the circumstances under which it's taken. All people do not experience the same effects, even in the same circumstances. Changes in behavior are partly the result of the amount of alcohol in the blood, which is determined by how quickly it's absorbed and oxidized. This in turn depends on a number of things, such as the strength of the alcoholic beverage taken, how much and what kind of food is in the stomach, and when the drinking is done. One or two cocktails taken on an empty stomach are likely to cause a higher concentration of alcohol in the blood than three or four taken during or after a meal. The mood of the person at the time of drinking can also make a big difference.

How drinking can cause complications

You may be wondering about some of the other effects of alcohol, such as illness and disease. These come about because the body requires certain things that alcohol can't provide. Here's the story.

To get through a normal day, your body needs fuel for energy and materials for repairing tissue, for normal functioning, and for growth. *Food*, with its proteins, fats, carbohydrates, vitamins, and minerals, provides you with these necessities. The body turns them into fuel and building materials by a chemical process called *metabolism*. Whatever calories—units of food energy—aren't used in your daily activities are stored away in your body for future use.

In some ways alcohol is like other foods. An ounce contains 200 calories, as compared to 114 calories in an ounce of carbohydrates and 270 calories in an ounce of fat. But there's a difference. The calories in alcohol can only be used as fuel and burned to produce energy in the form of heat. They can't be stored for future use, and they can't repair or build tissue. What's more, alcohol has none of the vitamins and minerals the body needs. So alcohol has very limited value as a food.

But how does it cause all the bodily disorders we hear about? Alcohol competes with other foods. It can't provide what the body needs,

Alcohol can cause harmful effects by competing with other foods.

yet an excessive drinker—an alcoholic—usually neglects other food. He loses his appetite and he's apt to be more interested in drinking than in eating. Then where does he get the fuel, building materials, and vitamins he needs for health? The answer is: He doesn't! A person who over a period of weeks gets about half of his calories from alcohol may have plenty of energy. But because of the serious deficiency of vitamins and minerals in his diet, he's likely to become severely ill.

Diseases

The excessive drinker may develop diseases stemming from lack of vitamins. From lack of thiamin, one of the B vitamins, he may get *beriberi*, a disease of the nervous system and the circulation. Muscular weakness, enlargement of the heart, and dropsy are common effects of this disease. Absence of niacin—another B vitamin—can cause *pellagra*, characterized by roughening of the skin, intestinal disorders, and mental disturbances. Of course, those heavy drinkers who manage to maintain a proper diet will not develop these disorders.

Cirrhosis of the liver does occur among non-drinkers, but it's more frequent among heavy drinkers. The exact connection between alcohol and this disease isn't yet clear. But cirrhosis probably goes along with disturbances in diet, and metabolism. The liver plays an important part in oxidizing alcohol, and is usually permanently damaged when cirrhosis occurs.

Alcohol is *not*, as far as we know, a direct cause of stomach ulcers, tuberculosis, cancer, or kidney ailments. But since a heavy drinker is likely to neglect hygiene and diet, he's exposed to many diseases and may not recover from them as easily as other people.

Some people believe that alcohol causes the brain cells to deteriorate. But as we've seen, there is never a great enough concentration of alcohol in the body to damage tissue. In fact, a relatively small percentage of heavy drinkers develop mental disorders.

A serious lack of vitamins, however, can cause deterioration of parts of the nervous system and so bring on mental diseases. Also, with continued neglect of ordinary hygiene, bodily efficiency declines and mental functions become sluggish. So mental disorders may occur in people who drink long and hard enough. Actually, every intoxicated person goes through a temporary mental disturbance, for he partly loses contact with reality.

The most dramatic disorder occurring among heavy drinkers is *delirium tremens*, which often hits people who otherwise seem in vigorous health. The victim shakes violently all over, and imagines he sees and